Marriage reform, polygamy and female intrahousehold bargaining: Evidence from Nigeria

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Abstract.

Evidence from empirical literature highlights income, education and pre-marriage assets as major factors in determining intrahousehold bargaining power of women. In this paper, I examine another possible determinant of female bargaining power: type of marriage. More specifically, I evaluate the impact of an Islamic law reform in northern Nigeria on polygamy while also exploiting differences in exposure to the reform by state of residence, age and year of marriage as a source of exogenous variation in polygamy to estimate its direct causal effect on female intrahousehold bargaining power. The results suggest that, compared to similar women not exposed to the reform, those in the affected group are 0.149 percentage points less likely to be polygamous. Further, on the average, not being polygamous increases female bargaining power by 0.335 percentage points.

Keywords: polygamy; female intrahousehold bargaining; Islamic law reform; Nigeria

1. Introduction

Poor countries by no means have a monopoly on gender inequality: men earn more than women in essentially all societies. However, disparities in health, education and bargaining power within marriage tend to be larger in these countries. A key component of the 2030 Agenda by the United Nations (UN), the Sustainable Development Goals (SDGs) aim to eliminate these imbalances in gender relations and empower all women and girls across the globe (Desa et al., 2016). To accomplish this, the SDGs have encouraged reforms aiming to confer women with rights to economic resources, as well as access to ownership and control over land and other forms of property, financial services, inheritance and natural resources, in accordance with national laws (Desa et al., 2016). In line with this, policies focusing on gender (in)equality at household, community and national levels have increasingly being pursued by governments and international development agencies (Wong, 2012). While this is globally relevant, it is especially important in sub-Sahara Africa (SSA), where the lowest levels of the Human Development Index (HDI) and Gender Inequality Index (GII) are observed (Annan et al., 2021). For Adesina (2016), the high prevalence of gender inequality in this region is driven by social and cultural institutions, including polygamy.

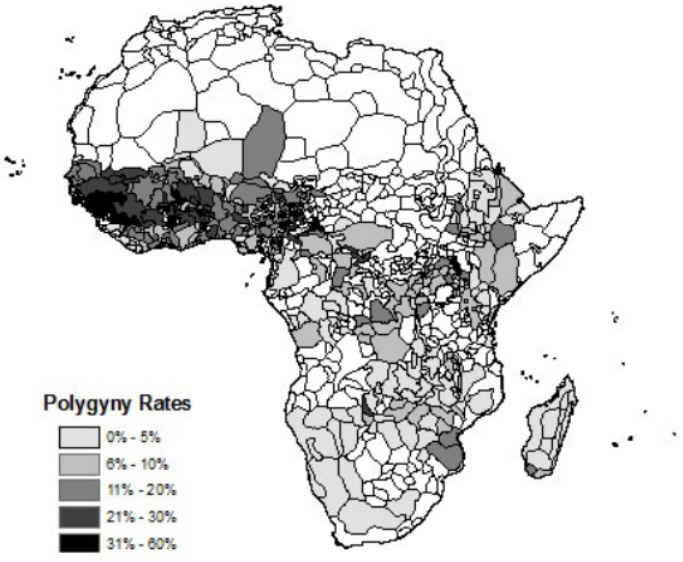


Figure 1: Polygamy in sub–Sahara Africa
Source: Dalton and Leung (2014)

Stretching from Senegal in the west to Tanzania in the east, in what is called the "polygamy belt", is a region of high concentration of polygamous women (Jacoby, 1995). This is especially the case in West Africa – as depicted in Figure 1 – where the proportion of polygamous women is the highest of any region in the world. Polygamy in this part of the world is not only a type of marriage but also a value system. As a value system, it has been highly resistant to competition from the imported western ideology of monogamy and to the impacts of various structural changes, including the transition from subsistence to a money economy, urbanization and the introduction of formal education. As a reflection of the persistency of this value system, the decline in polygamous marriages in urban areas has been accompanied by the growth of various forms of informal marriages, which involve "irregular girlfriends" and "outside wives" (Karanja, 1994; Mann, 1994). As a form of behavior, polygamy has been considered to be morally wrong (Goody and Goody, 1976). Notwithstanding this, the practice has been a well developed, coherent and highly patronized way of life for many sub-Saharan Africans since pre-colonial times. Despite this high prevalence and persistence of polygamy in the region, there is little empirical evidence on gender inequality in households with more than one wife. More specifically, to the best of my knowledge, no previous study has attempted to identify the causal effect of polygamy on female intrahousehold bargaining power, a measure of gender inequality among married women. In this paper, I attempt to evaluate the nature and extent of the relationship.

In doing this, I utilize an exogenous source of variation in polygamy that is not related to the bargaining power outcomes. A change to Islamic marriage laws occurred in Nigeria in 2000, when twelve states in the north of the country adopted a reform that legally recognized polygamous marriages as being equivalent to monogamous ones in all respects, with all co-wives, up to the fourth wife, enjoying equal legal status as monogamous women. First, in a difference-in-difference (DiD) framework, I evaluate the impact of this reform on polygamy. This approach is in line with a number of empirical studies testing the impact of government policies on socioeconomic outcomes, such as education (Duflo, 2001; Osili and Long, 2008; Chicoine, 2016), fertility (Osili and Long, 2008; Raute, 2019; Stichnoth, 2019) and child health (Duflo, 2003). To account for measurement errors arising from migration patterns, I estimate the model with and without Lagos state – the state with the highest level of out-of-state migrants in Nigeria. In addition, by running a placebo reform on the pre-reform data, I test for the presence of pre-existing differential trends in polygamy. Finally, I examine the effect of the reform by year

of marriage on polygamy. This is done to compare several cohorts of women before and after the reform. Beyond this, I exploit differences in exposure to the reform by state of residence, age and year of marriage as a source of exogenous variation in polygamy to examine its causal effect on female intrahousehold bargaining power. I do this in an instrumental variables (IV) framework. In the paper, I restrict the definition of polygamy to only include junior co-wives. This is because, senior co-wives in polygamous marriages do not (at the time of marriage) select into polygamy and also enjoy numerous privileges by virtue of their position. As a result, it is argued the two groups of polygamous women possess dissimilar characteristics (Munro et al., 2011). I examine the validity of this argument with regard to female intrahousehold bargaining power to provide evidence in favor of dropping senior co-wives from the analyses.

Employing three rounds of the Nigerian Demographic and Health Survey (NDHS) datasets for survey years 2008, 2013 and 2018, covering all 36 Nigerian states and Abuja – the capital, I provide evidence that the reform had a negative and substantial effect on polygamy. After accounting for survey year fixed effects, the results remain robust. Tests for measurement errors resulting from migration patterns and pre-existing differential trends in polygamy also reveal the results to be robust, while the impact of the reform by year of marriage on polygamy is only significant for those marrying post-reform and larger the later the year of marriage. On the impact of polygamy on bargaining outcomes, the results suggest not being polygamous to result in higher bargaining power for women, more so after accounting for endogeneity of polygamy. In alternative specifications, I control for survey year fixed effects, and the results remain robust. I also examine heterogeneity in terms of ethnicity and find the difference in bargaining power to be driven by Hausa-Fulani women. Finally, examining differences in bargaining power between polygamous senior co-wives and their junior counterparts, I find the former group to possess a higher bargaining power. I proffer two possible explanations for the difference in bargaining power between polygamous and monogamous women. First, decisions regarding fertility, child care, farming activities and household duties in polygamous households are shared, reducing the bargaining power of each individual woman. Second, men in polygamous societies can choose to marry additional wives, while women are only restricted to one husband. This suggests that polygamous men possess higher intrahousehold bargaining power, leaving their wives with less.

In undertaking this study, I make two contributions to the literature. First, I contribute to the empirical literature on female intrahousehold bargaining power. This strand of literature has identified income as a prominent channel for increasing female intrahousehold decision-making power (Buvinić and Furst-Nichols, 2016; Attanasio and Lechene, 2002). On this basis, numerous experimental studies and development policy interventions have provided women with training and capital as a means of reversing gender inequalities in household decision-making. For Antman (2014), there is a direct connection between increased economic power (especially in the form of money) and improved female intrahousehold bargaining power. Thus, enabling women to direct household resource allocations in their preferred direction – leading to improved individual and household outcomes. This is corroborated by empirical evidence. Increased female income and spending is associated with better child education (Duflo, 2003; Quisumbing and Maluccio, 2003; Martínez A, 2013), improved child feeding outcomes (Malapit et al., 2013; Malapit and Quisumbing, 2015), better health and nutrition (Bhagowalia et al., 2010; Ssewanyana and Kasirye, 2012; Lépine and Strobl, 2013), decreased tobacco and alcohol expenditure (Gummerson and Schneider, 2013) and increased food expenditure (Hoddinott and Haddad, 1995). Other determinants of female intrahousehold bargaining power have been highlighted by the literature. Briere et al. (2003) posits some of these to include improved access to common property resources, availability of public works schemes and gender-neutral legal and institutional rights. Doss (2013) cites education of the woman as well as her pre-marriage assets as key factors. In this paper, I examine another possible determinant of female intrahousehold bargaining power: type of marriage. More explicitly, I investigate if there is any difference in bargaining power between women in monogamous and those in polygamous marriages.

The paper also contributes to the literature on alternative family structures. Research in this direction has traditionally focused on single-parent families. These studies show single parents to experience higher rates of in-work poverty relative to couples in two-parent families (Nieuwenhuis and Maldonado, 2018). However, this is found to result from the presence of multiple income earners in two-parent families. Beyond this, single parents are less educated (McLanahan, 2004; Härkönen, 2018), more likely to have children performing poorly in school (Mugove, 2017) and possess higher probabilities of having part-time jobs or temporary contracts (Bardasi and Gornick, 2008). In line with the legalization of same-sex marriages across most developed countries, studies relating to these families have become common recently – with a particular focus on the well-being of children. Overall, these studies do not find any difference between children of homosexual and those of heterosexual parents in terms of education and cognitive ability (Rosenfeld, 2013; Fedewa and Clark, 2009; Lavner et al., 2012), social development (Wainright and Patterson, 2008) and psychological well-being (Wainright et al., 2004).

In the polygamy literature, the theoretical framework of Grossbard (1980), derived from the theory of marriage developed by Becker (1974), is able to adequately explain the emergence and persistence of polygamy at the society level. A key feature of the literature at the micro level is an examination of the dynamics between wives. For instance, although polygamous households may be intuitively expected to be inefficient due to competition between wives, the evidence is mixed: some studies reject the collective rationality of polygamous households (Dauphin et al., 2015) while others find their efficiency to be context-dependent (Dauphin, 2013). In addition, the lack of altruism in co-wife relationships leads to greater productive efficiency between co-wives than between spouses (Akresh et al., 2012, 2016; Adams et al., 2002; Bove et al., 2012). For contrast, co-wife rivalry is a source of fertility competition among polygamous women (Rossi, 2019), strategic time mis-allocation in child care (Arthi and Fenske, 2016) and health disparities by wife rank (Kazianga and Klonner, 2006). Meanwhile, Han and Foltz (2015) find that the degree of co-wife competition or cooperation depends on the ethnic context of polygamy. Kazianga and Klonner (2006) show the presence of a higher intrahousehold bargaining power for women in monogamous households relative to those in polygamous marriages. However, the authors stress that "each coefficient estimate quantifies a reduced form, not a causal effect" of the relationship between the variables. As an extension to this study, I exploit a natural experiment to evaluate the causal effect of polygamy on female intrahousehold bargaining power.

The remainder of this paper is organized as follows. The next section is devoted to discussing the Islamic reform used as a source of exogenous variation. Sections 3 and 4, respectively, present a description the data and a discussion of the empirical strategies utilized. In section 5, I present and discuss results for the impact of the reform on polygamy, while section 6 is devoted to examining the direct effect of polygamy on female intrahousehold bargaining power. Finally, section 7 concludes the paper.

2. The Islamic law reform

The practice of Islam in modern-day northern Nigeria out-dates the advent of Christianity in the South of the country, with the religion believed to have spread from the Northeast in the 15th Century. However, the spread of Islam in the North gained momentum around last quarter of the 18th Century, as a consequence of the Islamic revival in West Africa. This culminated in the formation of the Sokoto Caliphate in 1812 under the leadership of Uthman dan Fodio, an Islamic cleric. The Caliphate was annexed by the British in 1903 and integrated into the colony of Nigeria. From this period until 1960, northern Nigeria was governed through indirect rule, which maintained and utilized the region's existing forms of administration, from regional emirs to local judges, rather than replacing them with British officers and institutions

Figure 2: Sharia states in northern Nigeria
Source: Mustapha and Mustapha (2016)

(Reynolds, 2001). As a result, the colonial government actively discouraged the spread of Christianity in the North, viewing it as a threat to the system of governance (Barnes, 1995). At independence in 1960, an incentive for the spread of Islam emerged with the division of Nigeria into three semi-autonomous regions. In the Northern region, the deliberate government policy of 'islamization' led to the conversion of several northerners into Islam. The policy only lasted until 1966, when the government was overthrown in a military coup. Nevertheless, the 1970s saw continued government policy favoring the dominance of Islam across the entire country. This continued until the adoption of multi-party democracy in 1999. Between the 1970s and 1999, Nigeria was ruled by a series of military dictatorship governments comprising mostly of northern Muslims and significant minorities from the South-West – a region almost equally split between Muslims and Christians. People in the Christian-dominated South-East and South-South regions were deliberately alienated from these governments as punishment for their involvement in the overthrow of the first post-independence northern-led federal government and the subsequent Biafra war.

In a country with vast demographic and economic differences, Nigerians are more likely to identify with their religion than any other affiliations, perhaps even ethnicity (Reed and Mberu, 2015). This is likely linked to the country being almost evenly split between Christians and Muslims. Overall, Muslims constitute a share of the population ranging from 50 to about 54 percent (NDHS, 2019; Lugo and Cooperman, 2010). Several studies have argued Islamic support of polygamy as the main reason for its prevalence across parts of sub-Sahara Africa (Prasch, 1989). Based on this, changes to Islamic institutions and practices are expected to affect the practice of polygamy. These changes occurred in 2000 in northern Nigeria, when the then Governor of Zamfara state, Ahmad Sani Yerima, proclaimed the Sharia Law [1] as the pre-eminent legal system of the state. Within a few months, eleven other states, as shown in light blue in Figure 2, followed suit. Consequently, the states established several institutions to enforce the new legal system, including the Sharia Commission, Zakat Commission and the Hisbah (Mustapha and Mustapha, 2016). Already existing institutions, particularly state civil courts, were resourced and their jurisdiction extended to cover criminal matters (Kendhammer,

[1]The Sharia law is Islam's legal system. It is derived from both the Koran, Islam's central text, and fatwas – the rulings of Islamic scholars.

2013). In addition, new civil and criminal codes as well as social and economic policies were adopted (Paden, 2006). These were aimed at regulating all aspects of life's conduct to reflect Islamic traditions. In the marriage market, polygamous marriages gained legal recognition and were treated as being equivalent to monogamous ones in all respects, with all co-wives, up to the fourth wife, enjoying equal legal status as monogamous women. This, however, applied to marriages where the husband identified as Muslim. For non-Muslims in these states as well as people living in states not affected by the reforms, civil monogamous marriage laws still applied. Thus, polygamy, though prevalent among these unaffected groups, remained illegal for them.

At the time of implementing these reforms, about 45 million people representing close to 40 percent of the entire Nigerian population lived in the affected states. Of this, between 80 and 90 percent practiced Islam and were directly affected as a result. Also, based on the data used for the study, the reform had an immediate impact on polygamy in the affected states, with about 40 percent of women who married in 2000 being in polygamous unions. This represents a 2 percent decline relative those marrying in 1999 – the year before the reform. For comparison, the figure is about 21 percent in the unaffected states for both years.

3. Data

The paper relies on the 2008, 2013 and 2018 rounds of the NDHS for the analyses. This is a nationally representative survey that provides information on demographic, health and socioeconomic indicators for women and men aged 15 to 49 as well as children aged 5 and below. For the purpose of this study, I only consider married women. The women for whom information is collected are not the same across survey years. Therefore, the dataset is a pooled cross-section. The NDHS dataset is suitable for this study because it contains extensive information on the main variables of interest: female intrahousehold bargaining outcomes and polygamy. Equally important, it captures information on state of residence, age and year of first marriage. These are relevant for identification in the DiD framework. Besides these variables, the dataset contains information on ethnicity, religion, marriage age and literacy. These variables are constant over time and thus, are used to proxy for individual-level characteristics of women before marriage. Detailed data on these characteristics are available in the pooled sample for about 70,000 women across all 36 Nigerian states and Abuja, the capital.

Table 1 presents a brief description of the variables used for the analyses as well as their sources. To make for easy comparison, the sample is limited to women who married between 1990 and 2018. Table 2 presents a summary of the means and standard deviations of the variables for this sample before the implementation of the reform. This is done for the entire sample, the treatment group as well as the control group and presented in Columns (1), (2) and (3) respectively. The treatment group is comprised of married women aged 15-49 who reside in any of the twelve reform states while the control group consists of similar women living outside of the reform states. Column (4) presents results for difference-in-means tests between the two groups pre-reform. As the results indicate, there are statistically significant differences between them in terms of the individual-level characteristics. While this is not relevant for the identification of the DiD parameters, it is prudent to have the two groups be comparable before the treatment. Based on this, I adopt the entropy balancing approach, as proposed by Hainmueller (2012), to pre-process the data [2]. In doing this, I implement a reweighting scheme that assigns a scalar weight to each sample unit. For married women residing in the twelve

[2]Entropy balancing is a pre-processing procedure that allows researchers to create balanced samples for the subsequent estimation of treatment effects. Compared to other pre-processing approaches, entropy balancing allows the researcher to obtain a high degree of covariate balance by imposing a potentially large set of balance constraints that involve the first, second, and possibly higher moments of the covariate distributions as well as interactions. Second, it retains valuable information in the pre-processed data by allowing the unit weights to vary smoothly across units. Also, the weights that result from entropy balancing can be passed to almost any standard estimator for the subsequent estimation of treatment effects.

Table 1: Data description, measurement and sources

Variable	Description	Sources
Treat	Treat is an indicator variable that takes the value of one if the woman resides in any of the twelve reform states and zero otherwise.	Created by author
Post	This is a dummy taking the value of one if the woman became both polygamous and falls in range age range 15-49 after the implementation of the reform regardless of her state of residence	Created by author
Reform	Dummy equal to one if the woman was married and aged 15-49 after the reform while residing in the twelve reform states.	Created by author
Expense power	This is a dummy variable which takes the value one if the woman either solely or in consultation with the husband makes decisions regarding large household expenses and zero if she does not take part in the decision making	NDHS
Health power	This is a dummy variable which takes the value one if the woman either solely or in consultation with the husband makes decisions regarding her healthcare and zero if she does not take part in the decision making	NDHS
Polygamy	Dummy variable equivalent to one if the woman is a junior co-wife in a polygamous marriage and zero if she is monogamous.	NDHS
Junior co-wives	Dummy equal to one if the woman is a junior co-wife in a polygamous marriage and equal to zero if she is the senior co-wife	NDHS
Hausa	Dummy variable for belonging to the Hausa ethnic group	NDHS
Fulani	Dummy variable for belonging to the Fulani ethnic group	NDHS
Yoruba	Dummy variable for belonging to the Yoruba ethnic group	NDHS
Igbo	Dummy variable for belonging to the Igbo ethnic group	NDHS
Islam	Dummy variable for woman being a Muslim	NDHS
Christian	Dummy variable for woman being a Christian	NDHS
Age	The age of the woman in years	NDHS
Husband's age	The age of the husband in years	NDHS
Illiterate	Dummy variable equal to one if the woman is unable to read in English or any local language	NDHS
Marriage age	The age at which the woman got married	NDHS

Notes: Table constructed by author based on three rounds of the Nigeria Demographic and Health Surveys for the survey years 2008, 2013 and 2018.

Table 2: Summary statistics — comparing treatment and control groups pre-reform

	Non-weighted sample				Weighted sample		
	Full sample	Treatment group	Control group	Mean difference	Full sample	Treatment group	Control group
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Polygamy	0.30	0.46	0.21	0.245***	0.46	0.4561	0.456
	(0.46)	(0.50)	(0.41)	(0.005)	(0.50)	(0.4981)	(0.5981)
Hausa	0.14	0.36	0.02	0.342***	0.36	0.3589	0.3589
	(0.35)	(0.48)	(0.13)	(0.004)	(0.48)	(0.4797)	(0.4797)
Fulani	0.04	0.09	0.02	0.074***	0.09	0.09156	0.09156
	(0.21)	(0.29)	(0.13)	(0.002)	(0.29)	(0.2884)	(0.2884)
Yoruba	0.11	0.01	0.16	-0.157***	0.01	0.007509	0.00751
	(0.31)	(0.09)	(0.37)	(0.004)	(0.09)	(0.0863)	(0.0863)
Igbo	0.11	0.00	0.17	-0.168***	0.00	0.004429	0.004433
	(0.32)	(0.07)	(0.38)	(0.003)	(0.07)	(0.0664)	(0.0664)
Islam	0.46	0.90	0.22	0.673***	0.90	0.898	0.898
	(0.50)	(0.30)	(0.42)	(0.005)	(0.30)	(0.3026)	(0.3026)
Christian	0.52	0.09	0.76	-0.667***	0.09	0.09175	0.09175
	(0.50)	(0.29)	(0.43)	(0.005)	(0.29)	(0.2887)	(0.2887)
Marriage age	20.29	16.94	22.16	-5.219***	16.94	16.94	16.94
	(5.56)	(4.14)	(5.38)	(0.060)	(3.91)	(4.134)	(3.681)
Illiterate	0.51	0.81	0.34	0.479***	0.81	0.8145	0.8145
	(0.50)	(0.39)	(0.47)	(0.005)	(0.39)	(0.3887)	(0.3887)
Observations	29453	10505	18948		29143	10387	18756

Notes: Columns (1)-(3) represent the sample means and standard deviations for the entire sample, treatment and control groups respectively for the various variables using the original non-weighted sample. The treatment group are married women aged 15-49 who reside in any of the twelve reform states while the control group is comprised of similar women but residing outside of the twelve reform states. Column (4) is the mean-difference between the treatment and the control groups. Columns (5)-(7) represent the means and standard deviations of the variables for the three sample groups respectively after entropy balancing. Standard errors are reported in parentheses. * indicates significance at 10 percent, ** indicates significance at 5 percent, *** indicates significance at 1 percent level.

reform states as well as those women in non-reform states but married after the reform, the assigned scalar is equivalent to one. However, for women residing in non-reform states but married before the reform, the scalar is assigned such that means and standard deviations of their individual-level characteristics match exactly those of women in the reform states who also married before the reform. The summary statistics of the reweighted sample for the treatment and control groups, before the reform, are presented in Columns (6) and (7), respectively, of Table 2. These results show the comparison and treatment groups to be identical in terms of the individual-level characteristics considered.

In polygamous societies, senior co-wives are typically the oldest among the wives and closer in age to their husbands. As a result, they are accorded traditional privileges not enjoyed by their rival co-wives (Sween and Clignet, 1978). Also, in cultures where senior co-wives help their husbands pay the bride prices of junior wives – for instance, among the Igbo people of Southern Nigeria – the relationship between co-wives is best described as that of a mother (elder sister) and daughter (younger sister) instead of as rivals, leaving senior co-wives with relatively higher intrahousehold power (Leith-Ross, 1965). More importantly, senior co-wives do not (at the time of marriage) select into polygamy. Following from this, they do not have direct control over their polygamy status (assuming they do not divorce the husband once he marries a second wife). In contrast, junior co-wives select into polygamy and, as such, directly determined their polygamy status. Based on these, it is argued the two groups of polygamous women possess dissimilar characteristics and should be treated differently. This argument is supported by Munro et al. (2011), who find that when the polygamous husbands allocate proceeds from an investment in an experimental setting in northern Nigeria, senior co-wives receive higher returns than junior wives. Although this behavior may be evidence of favoritism, it may also be seen as the husband taking into account bargaining processes taking place outside the frame of the experiment. For the purpose of this paper, the definition of polygamy is restricted to only junior co-wives.

Although the NDHS dataset has many important advantages relevant for this study, it also has a few significant shortcomings. First, I would ideally like to know where the woman married. This is because the study exploits geographic variations (by states) in polygamy to examine its causal effect on female bargaining power. However, due to unavailability of this information, I use residence of women at the time of the survey as proxy. While this is reasonable, the identification is challenged if there is a significant share of movers in the sample. The NDHS has only limited information on migration. However, studies on migration patterns in Nigeria suggest that most Nigerians do not move or only move within-state. This is, however, not the case in Lagos state, which houses a noticeable number of out-of-states migrants. National Population Commission (1998) notes that, "If migration is defined as moves across state boundaries, most Nigerians can be classified as non-migrants. The only state with a sizable share of migrants is Lagos state, with 87 percent of its population migrating from other states." Therefore, the analyses are conducted with and without Lagos state, to account for possible measurement error resulting from migration. Second, even though the dataset has information on the year of the woman's first marriage, I am interested in the year of her current marriage. To correctly identify this, I restrict the sample to women married only once. These women represent about 90 percent of the currently-married sample I use for the paper. Finally, bargaining power outcomes are self-reported. While these women do not have incentives to lie, they do not also have any incentive to be truthful or objective. As a result, I am unable to guarantee if the responses are a true reflection of the household decision-making dynamics.

4. Empirical approach

The paper is based on two main objectives. First, to examine the impact of the reform on polygamy. Second, to evaluate the direct effect of polygamy of female intrahousehold bargaining power. In line with these objectives, I present two estimation strategies: a DiD framework and

an IV estimation approach.

4.1. Empirical approach #1: impact of the reform

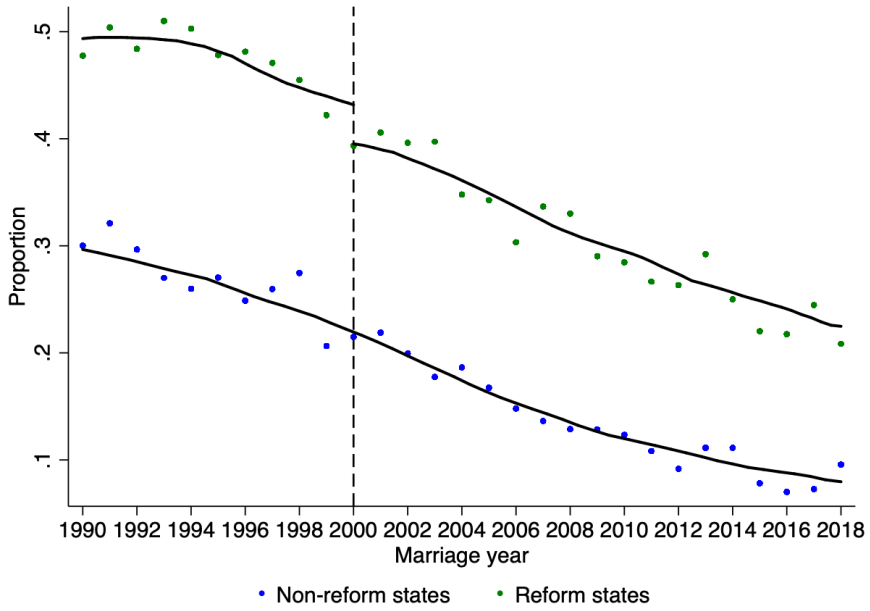
The Islamic law reform occurred in 2000 and was only implemented in twelve states of northern Nigeria. As a result, I am able to evaluate its impact on polygamy in a DiD framework. The first difference under this setup relates to the implementation of the reform, as captured by the woman's state of residence: twelve states in Nigeria implemented the reforms and, as such, only married women residing in these states could have been impacted by the new laws. The second difference is exposure to the reform by age and year of marriage. A direct consequence of the timing of the reform was that women in the treated states who married after the reform were exposed to a new legal system granting equal rights to both monogamous and polygamous unions while those who married before the reform did not enjoy such rights. To make for a more reasonable comparison of married women before and after the reform, I only consider those aged 15-49 in each period.

The DiD estimation of the effect of the reform on polygamy is described as:

$$Polygamy_{ijk} = \beta_0 + \beta_1 Treat_k \times Post_j + \beta_2 Post_j + \beta_3 Treat_k + X'_{ijk}\theta + \mathcal{E}_{ijk} \quad (1)$$

where i, j and k are indices for individuals, cohorts, and states respectively. $Polygamy_{ijk}$ is dummy variable equivalent to one if woman i from cohort j in state k is a junior co-wife in a polygamous marriage and zero if she is in a monogamous marriage. In the DiD framework, individual-level characteristics should ideally be measured pre-marriage. However, this is not possible given the absence of such information in the dataset. As an alternative, I utilize control variables that remain constant over time and, as such, can proxy for the characteristics of women before marriage. These include ethnicity (Hausa, Fulani, Yoruba and Igbo), age at marriage, religion (Islam and Christianity) and literacy. The vector X'_{ijk} represents these variables. $Treat_k$ is an indicator variable capturing the implementation of the Islamic law reform in terms of states of residence. Women residing in any of Zamfara, Katsina, Kebbi, Sokoto, Niger, Kaduna, Kano, Jigawa, Bauchi, Gombe, Yobe and Borno states take the value one while those residing in the remaining 24 states and Abuja are assigned zero. $Post_j$ captures exposure to the reform by age and year of marriage. Women who were aged 15-49 and married after the reform are assigned the value one while those who were aged 15-49 and married before the reform take the value of zero. The treatment variable is $Treat_k \times Post_j$ and is obtained as the interaction of $Treat_k$ and $Post_j$. As a result, it captures women who were married and aged 15-49 after the reform while residing in the twelve reform states in the North. A direct consequence of the legalization of polygamous marriages is the fact that polygamous women gained legal rights over their husbands. As a result, they became entitled to financial support as well as other benefits from their husbands. Husbands failing to provide these would be in breach of the law and be liable for prosecution by state governments through the Sharia courts. Given this 'increased cost' of having multiple wives as a result of the reform, I expect the reform to reduce polygamy. Therefore, β_1, measuring if women affected by the reform experienced different levels of polygamy relative to comparable women not affected by the reform, is expected to be negative. To compare differences between the non-weighted and weighted samples, I estimate this relationship using both samples.

The identifying assumption of the DiD approach is the so-called "parallel trends" assumptions. This requires that in the absence of the treatment, differences between the treatment and control groups remain constant over time. While this is not empirically testable, a graphical representation of the outcome of interest for the treatment and control states, before and after the reform, provides a good context to examine its validity. In Figure 3, I present the proportion of polygamy for women who married from 1990 to 2018 in the treatment and control states. The Figure shows polygamy to be more prevalent in the treated states relative to states not affected by the reform, with the two groups exhibiting similar trends before the implementation



Notes: The figure presents the proportion of polygamy among married women by year of marriage in the treatment and comparison states before and after the reform

Figure 3: Proportion of polygamy

of the reform. After the reform, there is no noticeable change in the trend of polygamy in the control states while for the treated states, there is an immediate decline in 2000, the year of the reform. Beyond 2000, polygamy in the affected states continues to decline, with the trends showing no sign of convergence between the groups in the near future. The Figure provides evidence in favor of the parallel trends assumption as well as the reform having a substantial effect on polygamy. I formally examine the extent of this effect in subsequent analyses.

4.2. Empirical approach #2: polygamy and female bargaining power

A major limitation of the existing literature is the absence of studies examining the causal effect of polygamy on female bargaining outcomes. Resolving this limitation is relevant because if polygamy has a causal negative impact on female bargaining outcomes, policy interventions aimed at reducing gender inequality and empowering women would have to also be targeted at dissuading them from entering into polygamous marriages. As a result, in examining the effect of polygamy on female intrahousehold bargaining power, I adopt an IV estimation technique. This is necessary for a couple of reasons. First, the presence of reverse causality between polygamy and bargaining outcomes. Quite simply, in households where there are multiple wives, decision-making powers of each co-wife is diluted, since there are finite decisions to be made by a relatively larger number of people. Conversely, in households where women have greater bargaining power, such women are more likely to successfully dissuade their husbands from taking additional wives. Second, unobservable individual, household and community-level characteristics could affect both polygamy and female bargaining outcomes. For instance, improved economic development could lower the prevalence of polygamy while also enhancing female bargaining outcomes. On the individual level, polygamy could proxy for unobservable features, including parental background and social status, which could also directly affect bargaining outcomes. Estimating the impact of the polygamy on female intrahousehold bargaining power without accounting for these factors in an Ordinary Least Square (OLS) framework yields biased results.

Adopting the reform as the instrument for polygamy raises a critical challenge – post-reform polygamy patterns may be correlated with time-varying trends and state-level unobservable

features. In resolving this challenge, I incorporate individual-level variations before the reform as part of the instrument. I do this by utilizing the interaction of the reform dummy and spousal age difference (wife age – husband age). Polygamous marriages are characterized by large spousal age differences. While senior co-wives are generally closer in age to the husband, their junior counterparts tend to be much younger. This phenomena is explained by the fact that men marrying additional wives tend to do so several years after the first marriage – mostly after the first wife has bore children. By this time, women of similar age to them would mostly be married already, leaving such men with a pool of younger women to choose from. Based on this, spousal age difference in polygamous marriages increases with wife rank. Barbieri et al. (2005) note that large spousal age difference is a feature of the African marriage system, where polygamy is pervasive.

Identification under the IV framework requires that a number of assumptions hold. The most consequential of these are the "exclusion restriction" and "relevance" assumptions. The relevance assumption requires the instrument to have a partial and strong correlation with polygamy. In testing its validity, I present the estimation of the first-stage regression as:

$$Polygamy_{ijk} = \omega_0 + \omega_1(Age\_gap_{ijk} \times Reform_{jk}) + X'_{ijk}\phi + \mathcal{V}_{ijk} \tag{2}$$

where $Polygamy_{ijk}$ and X'_{ijk} are the same as previously defined. $Reform_{jk}$ is a dummy variable representing women who were married and aged 15-49 after the reform while residing in the twelve reform states in the North. Age_gap_{ijk} is the difference in age between the wife and her husband (wife age – husband age). $Age\_gap_{ijk} \times Reform_{jk}$, the instrument, is the interaction between Age_gap_{ijk} and $Reform_{jk}$. A statistically significant ω_1 is proof of the validity of the relevance assumption. The assumption of exclusion restriction requires that the instrument affects female intrahousehold bargaining outcomes only through polygamy. While this is not empirically verifiable, the fact that the reform did not directly aim to improve female bargaining power is an indication that it could be valid. In addition, I estimate the correlations between the instrument and the control variables as further evidence in favor of the assumption.

After estimating the first-stage regression, I proceed to evaluate the direct causal effect of polygamy on female intrahousehold bargaining power under the specification:

$$BP'_{ijk} = \alpha_0 + \alpha_1 \widehat{Polygamy}_{ijk} + X'_{ijk}\psi + \mathcal{E}_{ijk} \tag{3}$$

where BP'_{ijk} is a vector of female bargaining power outcomes: expense power and health power. Expense power is a dummy variable assigned the value of one if the woman, either solely or in consultation with her husband, makes decisions regarding large household expenses and zero if she does participate in making such decisions. Health power is also a dummy variable which takes one if the woman, either solely or in consultation with her husband, makes decisions regarding her personal healthcare and zero if she does not participate in making her personal healthcare decisions. $\widehat{Polygamy}_{ijk}$ represents estimated polygamy from the first-stage regression and X'_{ijk} is a defined previously. The causal effect of polygamy on female intrahousehold bargaining power is captured by α_1, and I expect it to be negative. With more wives, decision-making powers of each co-wife is diluted, since there are finite decisions to be made by a relatively larger number of people. Also, men in polygamous societies can choose to marry additional wives, while women are only restricted to one husband. This suggests that polygamous men possess higher intrahousehold bargaining power, leaving their wives with less of it.

The models presented and discussed represent baseline specifications of the relationships between the variables of interest. Beyond this, I control for survey year fixed effects in addition to the baseline individual-level characteristics. Given that data for the paper was collected over a 10-year period and across three NDHS rounds (2008, 2013 and 2018), I do this to account for time-varying trends.

5. Results #1

In this section, I present and discuss results for the impact of the reform on polygamy. Beyond this, I test for the presence of measurement errors resulting from migration patterns by re-estimating the models without Lagos state – the state with the highest level of out-of-state migrants in Nigeria. In addition, I test for the presence of pre-existing differential trends in polygamy by utilizing a placebo reform while also presenting results for the effect of the reform by year of marriage on polygamy. I do this for both non-weighted and weighted samples, to observe differences that result from adopting the entropy balancing technique.

5.1. Impact of the reform on polygamy

Table 3 reports results for the impact of the reform on polygamy. For comparison, I present results for both the original and weighted samples. Results for the baseline specifications are presented in Columns (1) and (3). This controls for ethnicity (Hausa, Fulani, Yoruba and Igbo), age at marriage, religion (Islam and Christianity) and literacy. In addition to the individual-level control variables in the baseline specification, I control for survey year fixed effects in Columns (2) and (4).

Table 3: Impact of the reform on polygamy — DiD analysis

Dependent variable	Polygamy			
	Weighted sample		Non-weighted sample	
	Baseline specification	Survey year FEs	Baseline specification	Survey year FEs
	(1)	(2)	(3)	(4)
Treat × *Post*	-0.149***	-0.155***	-0.145***	-0.148***
	(0.00617)	(0.00653)	(0.00607)	(0.00611)
Treat	0.0464***	0.0486***	0.0707***	0.0713***
	(0.0117)	(0.0118)	(0.00656)	(0.00658)
Post	-0.104***	-0.109***	-0.0370***	-0.0306***
	(0.00882)	(0.00956)	(0.00610)	(0.00665)
Observations	57306	57306	57459	57459
R-squared	0.103	0.104	0.114	0.115
Mean (Control group)	0.251		0.251	

Notes: The outcome variable is polygamy. For comparison, I present results for both the original non-weighted and weighted samples, each with a baseline specification as well as control for survey year fixed effects. Results for the baseline specifications are presented in Columns (1) and (3). This controls for ethnicity (Hausa, Fulani, Yoruba and Igbo), age at marriage, religion (Islam and Christianity) and literacy. In addition to the individual-level control variables in the baseline specification, I control for survey year fixed effects in Columns (2) and (4). Robust standard errors are reported in parentheses. *, ** and *** indicate significance at 10 percent, 5 percent and 1 percent level.

The baseline results show the reform to have a negative and statistically significant impact on polygamy. More specifically, the reform decreased the probability of polygamy by 0.149 percentage points for women who were aged 15-49 and married after 2000 while living in any of the twelve reform states. After controlling for fixed effects in a subsequent specification in Column (2), I find that, although in the same direction, the effects are statistically different from the baseline estimates, with a p-value of 0.0015. These results are consistent with estimates obtained from using the original non-weighted sample, where the reform is estimated to decrease the probability of polygamy by 0.145 percentage points in the baseline specification. Additional tests reveal a statistically significant difference between this and an alternative specification in Column (4) (p-value = 0.004). Based on the results, the reform had a substantial impact on polygamy. This is because, its impact on the affected group is equivalent to about 60 percent of

the prevalence rate of polygamy in the control group. A direct consequence of the legalization of polygamous marriages is the fact that polygamous women gained legal rights over their husbands. As a result, they became entitled to financial support as well as other benefits from their husbands. Husbands failing to provide these would be in breach of the law and be liable for prosecution by state governments through the Sharia courts. Given this 'increased cost' of having multiple wives as a result of the reform, polygamy declines.

While no previous study has examined the impact of the Islamic law reform on polygamy, Fenske (2015) evaluates the effect of a number of government interventions in sub-Sahara Africa on polygamy. The Nigerian Universal Primary Education (UPE) program exposed specific cohorts of children from certain regions of the country to additional primary schooling. Using a DiD approach, the author finds no effect on whether women exposed to the program married polygamously. Similarly in Kenya, a reform of the education system during the 1980s lengthened primary school, leading to an average increase in schooling attainment for affected cohorts. Identifying treatment effects using non-linearities in exposure across cohorts, he finds no effects on polygamy. In Sierra Leone, a Free Primary Education (FPE) program benefited certain cohorts and varied in intensity over space. Utilizing a DiD framework, the study finds only weak evidence that the program affected polygamy. More precisely, while point estimates are consistently negative, they are insignificant and small in most specifications. Robustness exercises suggest a significant negative effect of the program, but only if variation over space in program intensity is not used for identification. Lastly, in Zimbabwe, the end of white rule is linked to higher levels of education among black women. However, using a regression discontinuity design (RDD) that compares cohorts just young enough to be treated by this change with their older peers, the paper finds no effect on polygamy. This result is robust to changing the width of the window around the cutoff age and discarding cohorts just around the cutoff. Also, IV estimates are insignificant and, at their most negative, still suggest a causal effect that is smaller than the raw correlation observed in the data. In contrast to the Islamic law reform used in this paper, policy changes utilized by Fenske (2015) were not primarily aimed at the marriage market, but instead on increasing education attainment. This could explain the difference between the results of this paper – where the policy change has a statistically significant impact on polygamy – and the results from Fenske (2015) – where there are not statistically significant effects of the policies on polygamy.

5.2. Robustness checks

In an ideal setting, the identification strategy would depend on the state of residence of the woman at the time of marriage. However, due to unavailability of this information in the dataset, I use current state of residence as a proxy. This is a perfect approximation if the respondents have never migrated between states, but becomes unreliable if there are significant numbers of out-of-state movers. The NDHS has only limited information on migration. However, studies on migration patterns in Nigeria suggest that most Nigerians do not move or only move within-state. This is, however, not the case in Lagos state, which houses a noticeable number of out-of-states migrants. Based on this, I re-estimate the impact of the reform without Lagos state, to account measurement errors resulting from migration patterns. The results are in Table 4.

As Table 4 shows, the results from estimating the impact of the reform on polygamy, excluding Lagos state, are an exact replica of the original results. This is true for both the baseline and alternative specifications in both samples, indicating that there are no measurement errors resulting from migration patterns in the sample.

Another threat to the identification of the impact of the reform on polygamy relates to the fact that the decrease in the probability of polygamy for the treatment group may be caused by the presence of pre-existing differential trends in polygamy rather than the reform. While the graphical evidence from Figure 3 suggests parallel trends pre-reform, I further assess the

Table 4: Evidence in favor of identification strategy — excluding Lagos state

Dependent variable	Polygamy			
	Weighted sample		Non-weighted sample	
	Baseline specification	Survey year FEs	Baseline specification	Survey year FEs
	(1)	(2)	(3)	(4)
Treat × *Post*	-0.149***	-0.156***	-0.145***	-0.147***
	(0.00617)	(0.00653)	(0.00607)	(0.00612)
Observations	55385	55385	55538	55538
R-squared	0.102	0.103	0.110	0.111
Mean (Control group)	0.260		0.260	

Notes: The outcome variable is polygamy – excluding Lagos state from the sample. For comparison, I present results for both the original non-weighted and weighted samples, each with a baseline specification as well as control for survey year fixed effects. Results for the baseline specifications are presented in Columns (1) and (3). This controls for ethnicity (Hausa, Fulani, Yoruba and Igbo), age at marriage, religion (Islam and Christianity) and literacy. In addition to the individual-level control variables in the baseline specification, I control for survey year fixed effects in Columns (2) and (4). Robust standard errors are reported in parentheses. *, ** and *** indicate significance at 10 percent, 5 percent and 1 percent level.

validity of this parallel time-trend assumption by running a placebo reform on the pre-reform data, pretending that the reform occurred in the pre-reform period. For this purpose, I use 1990 as the 'pretend' reform year. I thus, redefine the pre-reform and post-reform periods as marriage years 1969 to 1898 and 1990 to 1999 respectively. In this setting, none of the groups were exposed to the reform. However, if polygamy decreased faster in the reform states before the implementation of the reforms, I expect to find a statistically significant effect of the reform on polygamy for this unexposed cohort in the treatment states. The results from these estimations are reported in Table 5.

Table 5: Evidence in favor of identification strategy — placebo reform year (1990)

Dependent variable	Polygamy			
	Weighted sample		Non-weighted sample	
	Baseline specification	Survey year FEs	Baseline specification	Survey year FEs
	(1)	(2)	(3)	(4)
Treat × *Post*	-0.00802	-0.0142	-0.00953	-0.0117
	(0.00864)	(0.00998)	(0.00848)	(0.00850)
Observations	28650	28650	28803	28803
R-squared	0.074	0.077	0.108	0.108
Mean (Control group)	0.276		0.276	

Notes: The outcome variable is polygamy – with 1990 as the placebo reform year. For comparison, I present results for both the original non-weighted and weighted samples, each with a baseline specification as well as control for survey year fixed effects. Results for the baseline specifications are presented in Columns (1) and (3). This controls for ethnicity (Hausa, Fulani, Yoruba and Igbo), age at marriage, religion (Islam and Christianity) and literacy. In addition to the individual-level control variables in the baseline specification, I control for survey year fixed effects in Columns (2) and (4). Robust standard errors are reported in parentheses. *, ** and *** indicate significance at 10 percent, 5 percent and 1 percent level.

From Table 5, comparing consecutive cohorts not affected by the reform does not yield any statistically significant effect of the reform on polygamy for the the baseline specifications as well as specifications controlling for survey year fixed effects, for both samples. This is evidence in favor of the absence of pre-existing differential trends in polygamy, further strengthening the validity of the identification strategy.

To be able to compare several cohorts not affected by the reform to those affected either at the beginning or in later years, I estimate the impact of the reform by year of marriage on

polygamy for the entire sample, consisting of all women who married from 1969 to 2018. In doing this, I create ten groups, each consisting of a five-year window for the year of marriage. I denote the control group as those women who married from 1969 to 1973. The results from this estimation are reported in Table 6.

Table 6: Impact of reform by year of marriage

Dependent variable	Polygamy			
	Weighted sample		Non-weighted sample	
	Baseline specification	Survey year FEs	Baseline specification	Survey year FEs
	(1)	(2)	(3)	(4)
Marriage year 1974 – 78 × *Treat*	-0.0119	-0.0142	-0.0115	-0.0128
	(0.0475)	(0.0475)	(0.0474)	(0.0474)
Marriage year 1979 – 83 × *Treat*	-0.0148	-0.0191	-0.0140	-0.0163
	(0.0458)	(0.0458)	(0.0457)	(0.0457)
Marriage year 1984 – 88 × *Treat*	0.0111	0.00449	0.0122	0.00877
	(0.0449)	(0.0450)	(0.0448)	(0.0448)
Marriage year 1989 – 93 × *Treat*	0.0114	0.00478	0.0126	0.00919
	(0.0446)	(0.0447)	(0.0445)	(0.0445)
Marriage year 1994 – 99 × *Treat*	-0.0139	-0.0208	-0.0124	-0.0160
	(0.0443)	(0.0445)	(0.0442)	(0.0442)
Marriage year 2000 – 04 × *Treat*	-0.0904**	-0.0980**	-0.0886**	-0.0925**
	(0.0442)	(0.0444)	(0.0441)	(0.0442)
Marriage year 2005 – 09 × *Treat*	-0.153***	-0.161***	-0.151***	-0.155***
	(0.0442)	(0.0444)	(0.0441)	(0.0442)
Marriage year 2010 – 14 × *Treat*	-0.195***	-0.207***	-0.193***	-0.199***
	(0.0444)	(0.0448)	(0.0442)	(0.0444)
Marriage year 2015 – 18 × *Treat*	-0.243***	-0.257***	-0.240***	-0.247***
	(0.0448)	(0.0453)	(0.0448)	(0.0450)
Observations	67652	67652	67805	67805
R-squared	0.120	0.120	0.119	0.119
Mean (Control group)	0.276		0.276	

Notes: The outcome variable is polygamy, with those who married from 1969 to 1973 designated as the comparison group. For comparison, I present results for both the original non-weighted and weighted samples, each with a baseline specification as well as control for survey year fixed effects. Results for the baseline specifications are presented in Columns (1) and (3). This controls for ethnicity (Hausa, Fulani, Yoruba and Igbo), age at marriage, religion (Islam and Christianity) and literacy. In addition to the individual-level control variables in the baseline specification, I control for survey year fixed effects in Columns (2) and (4). Robust standard errors are reported in parentheses. *, ** and *** indicate significance at 10 percent, 5 percent and 1 percent level.

From Table 6, it can be seen that the reform led to a decrease in the probability of polygamy in the post-reform cohorts compared to a statistically insignificant effect in the pre-reform cohorts. More specifically, I do not find any statistically significant difference in the probability of polygamy between the treatment and control groups pre-reform. After implementing the reform, I find all treatment cohorts to experience a decrease the probability of polygamy relative to the control cohort. This is true irrespective of the model specification and the sample. Further tests reveal the decrease in the probability of polygamy, post-reform, to be larger the later the year of marriage, suggesting a long-term impact of the reform on polygamy.

6. Results #2

Here, I examine the causal effect of polygamy on female bargaining outcomes. Before this, I evaluate the validity of the relevance and exclusion restriction assumptions. These are done using the non-weighted sample.

6.1. Polygamy and female bargaining power

While the assumption of exclusion restriction is not empirically verifiable, the fact that the reform did not directly aim to improve female bargaining power is an indication that it could be valid. Beyond this, I estimate the correlations between the instrument and the control variables as further evidence in favor of the assumption and report the results in Table 7.

Table 7: Correlation between instrument and women characteristics

	$Reform \times age\_gap$			
	Coefficient	Robust SE	t-value	Observations
	(1)	(2)	(3)	(4)
Hausa	-0.0085	0.02776	-0.3072	57278
Fulani	-0.00158	0.0136	-0.1161	57278
Yoruba	0.0042	0.0135	0.3111	57278
Igbo	0.0034	0.0145	0.233	57278
Islam	-0.0165	0.0321	-0.531	57249
Christian	0.01614	0.0326	0.5042	57327
Marriage age	0.18121***	0.03176	5.7119	57327
Illiterate	0.01089	0.0292	0.3729	57263

The outcome variables are the characteristics of the women: ethnicity (Hausa, Fulani, Yoruba and Igbo), age at marriage, religion (Islam and Christianity) and literacy. In column (1), I report the correlation between each of these variables and $Reform \times age\_gap$. Columns (2), (3) and (4) report the robust standard errors, t-value and number of observations, respectively. *, ** and *** indicate significance at 10 percent, 5 percent and 1

From Table 7, I provide evidence that the instrument has no correlation with individual-level characteristics used as controls, except for the woman's age at marriage. While this is not a formal test of the validity of the exclusion restriction assumption, the fact that the instrument is not correlated with the control variables provides support for it not influencing female bargaining power through any of these variables. This is an indication that the assumption of exclusion restriction could be valid.

After providing evidence in favor of the exclusion restriction, I proceed to examine the first-stage results as well as the direct causal effect of polygamy on female intrahousehold bargaining power and report the results in Table 8. From the Table, Panels A and B present the OLS and IV estimations respectively. The outcome variables are polygamy (first-stage), expense power and health power. Estimated results for these outcomes are presented in Columns (1)-(2), (3)-(4) and (5)-(6) respectively. Results for the baseline specifications are presented in Columns (1), (3) and (5). These control for ethnicity (Hausa, Fulani, Yoruba and Igbo), age at marriage, religion (Islam and Christianity) and literacy. In addition to the individual-level control variables in the baseline specifications, I control for survey year fixed effects in Columns (2), (4) and (6).

Table 8: The effect of polygamy on bargaining outcomes

A. OLS estimation				
Dependent variable	Expense power		Health power	
	Baseline specification	Survey year FEs	Baseline specification	Survey year FEs
	(3)	(4)	(5)	(6)
Polygamy	-0.0556***	-0.0552***	-0.0353***	-0.0349***
	(0.00431)	(0.00431)	(0.00443)	(0.00443)
Observations	52935	52935	52935	52935
R-squared	0.228	0.228	0.233	0.235

B. Instrumental variables estimation						
	First-stage		Polygamy and female bargaining			
Dependent variable	Polygamy		Expense power		Health power	
	Baseline specification	Survey year FEs	Baseline specification	Survey year FEs	Baseline specification	Survey year FEs
	(1)	(2)	(3)	(4)	(5)	(6)
Reform × age_gap	-0.00895***	-0.00964***				
	(0.000319)	(0.000331)				
Polygamy			-0.317***	-0.325***	-0.353***	-0.325***
			(0.0307)	(0.0292)	(0.0322)	(0.0315)
Observations	52781	52781	52781	52781	52781	52781
R-squared	0.146	0.148	0.180	0.177	0.163	0.176
F-statistic	627.6	566.8				
Mean (Control group)			0.446		0.468	

Notes: Panels A and B present the OLS and IV estimations respectively. The outcome variables are polygamy, expense power and health power presented in Columns (1)-(2), (3)-(4) and (5)-(6) respectively. Results for the baseline specifications are presented in Columns (1), (3) and (5). These control for ethnicity (Hausa, Fulani, Yoruba and Igbo), age at marriage, religion (Islam and Christianity) and literacy. In addition to the individual-level control variables in the baseline specifications, I control for survey year fixed effects in Columns (2), (4) and (6). Robust standard errors are reported in parentheses. *, ** and *** indicate significance at 10 percent, 5 percent and 1 percent level.

Before presenting the IV results, I first report the results from estimating OLS regressions in Panel A. While the OLS estimation does not account for the endogeneity of polygamy, doing this enables me to identify the magnitude and direction of its bias. The results suggest a relatively small, but statistically significant impact of polygamy on female bargaining outcomes. Results from the baseline specification show not being polygamous to increase female intrahousehold bargaining power probability in terms of large household expenses by 0.056 percentage points on the average. This is robust to controlling for survey year fixed effects in Column (4), with a statistically significant difference between the baseline results and this alternative specification (p-value=0.0050). Regarding female bargaining power in terms of personal healthcare decisions, not being polygamous increases its probability by 0.035 percentage points in the baseline model. Again, results are robust to the alternative specification, with a statistically significant difference between this and the baseline results (p-value=0.0591).

In Panel B, I report results for both the first-stage and the causal impact of polygamy on female bargaining outcomes. Results from the first-stage regressions show a negative and statistically significant effect of the instrument on polygamy, which is robust to controlling for survey year fixed effects in Column (2). Further tests reveal a statistically significant difference between the baseline results and the ones obtained from the alternative specification, with a p-value of about 0.000. In addition, the F-statistics for all specifications are above 10. These suggest the interaction of reform dummy and spousal age difference to be a significant determinant of polygamy, even after accounting for several individual-level control variables.

The IV approach accounts for endogeneity of polygamy and thus, estimates the causal effect of polygamy on the bargaining outcomes. These results suggest a substantial effect of polygamy on bargaining outcomes. More precisely, not being polygamous increases the probability of expense power by 0.317 percentage points, on the average, in the baseline specification. When controlling for fixed effects in an alternative specification, I find similar but statistically different estimates. Results for the impact of polygamy on personal healthcare power are similar. In the baseline estimation, not being polygamous increases the probability of health power by 0.353 percentage points, on the average. Once more, the result is robust to alternative specifications. The results imply that type of marriage (polygamy vs monogamy) is a substantial determinant

of female intrahousehold bargaining power. This is due to the fact that it accounts for about 70 percent of the bargaining power of monogamous women. I test for the difference between the OLS and IV results and find it to be statistically significant. This suggests that the OLS may underestimate the magnitude of the impact of polygamy on female intrahousehold bargaining power.

I posit two possible explanations why women in polygamous households have less bargaining power. First, the value of any single wife's assets may be lower in polygamous households if fertility, child care, farming activities and household duties are shared among the co-wives. Standard theory predicts that a communal household will lead to some free-riding on supplying household public goods and differential attention to those for which the private returns are possibly higher (e.g. one's own children). Further, once marginal productivity begins to decline, another wife may take over activities. Depending on the structure of the household and whether there is cooperation or competition, a woman's assets – such as her health or education – may be relatively more or less important to household welfare. Second, a woman's exit options – or her reservation utility – are different in areas where polygamy is common. For example, where gender norms restrict women's market participation, a common asset like education may have a weaker effect on a woman's bargaining power. Similarly, a wife's bargaining power in a polygamous household may be lower than in a monogamous one simply because the polygamous husband has more options (and hence more bargaining power): the husband can choose to take an additional wife, but the wife cannot take an additional husband.

6.2. Heterogeneity by ethnicity

In a country as diverse as Nigeria, the impact of polygamy on female bargaining outcomes may be heterogeneous and thus, only affecting a subset of the population. Based on this, I evaluate the impact of polygamy across the three major ethnic groups: Hausa-Fulani, Yoruba and Igbo. I consider ethnicity as a source of heterogeneity for a few reasons. First, the practice of polygamy, though common across all three major ethnicities, is more pronounced among the Hausa-Fulani people. As the data used for the paper shows, almost 40 percent of Hausa-Fulani women are polygamous, with about 17 percent being bigamous while 21 percent have more than one co-wife. For Igbo and Yoruba women, about 9 percent and 17 percent respectively are polygamous. The observed differences in the prevalence of polygamy across ethnic groups in Nigeria is a well documented phenomenon and not localized to the data. Second, female intrahousehold bargaining power, just like any other socioeconomic outcome, is culture-dependent. In sub-Sahara Africa, household responsibilities and dynamics between the husband and wife are largely determined by the cultural setting. Among the Hausa-Fulani, the ideology of 'tsari' (seclusion) maintains that married women in their sexually reproductive years remain in the private sphere, secluded behind the high walls of domestic compounds, 'invisible' to all men but close family relations. With permission from their husbands, they may leave their houses, but only after dark or for essential visits to relatives on occasions such as births, marriages, sickness or death only. They may also go out to seek healthcare and for other reasons deemed appropriate. Among women of Igbo and Yoruba ethnicities, these restrictions do not generally apply. I present the IV results for the different ethnicities in Table 9.

The results reported in Table 9 show there is a negative and statistically significant relationship between the instrument and polygamy for all the sub-samples, across all specifications. Further, the F-statistics for all specifications are above 10. These suggest the instrument to be a significant determinant of polygamy, even after accounting for several controls. Also, the difference in bargaining power between monogamous and polygamous women is driven by Hausa-Fulani women. This is true for each of the two measures of bargaining power and also for the different specifications of the model. For the other ethnicities, I do not find any statistically significant difference between monogamous and polygamous women.

Table 9: The effect of polygamy on bargaining outcomes — heterogeneity by ethnicity

A. Hausa and Fulani ethnicity						
	First-stage		Polygamy and female bargaining			
Dependent variable	Polygamy		Expense power		Health power	
	Baseline specification	Survey year FEs	Baseline specification	Survey year FEs	Baseline specification	Survey year FEs
	(1)	(2)	(3)	(4)	(5)	(6)
Reform × *age_gap*	-0.0136***	-0.0143***				
	(0.000556)	(0.000577)				
Polygamy			-0.206***	-0.162***	-0.169***	-0.113***
			(0.0295)	(0.0289)	(0.0323)	(0.0315)
Observations	13004	13004	13004	13004	13004	13004
R-squared	0.094	0.095	0.009	0.030	0.020	0.040
F-statistic	109.5	98.6				
B. Igbo ethnicity						
	First-stage		Polygamy and female bargaining			
Dependent variable	Polygamy		Expense power		Health power	
	Baseline specification	Survey year FEs	Baseline specification	Survey year FEs	Baseline specification	Survey year FEs
	(1)	(2)	(3)	(4)	(5)	(6)
Reform × *age_gap*	-0.00200**	-0.00234**				
	(0.00100)	(0.00106)				
Polygamy			0.576	-0.708	-0.0973	-0.249
			(0.696)	(0.596)	(0.567)	(0.752)
Observations	4796	4796	4796	4796	4796	4796
R-squared	0.0128	0.129	0.041	0.058	0.068	0.041
F-statistic	25.47	22.17				
C. Yoruba ethnicity						
	First-stage		Polygamy and female bargaining			
Dependent variable	Polygamy		Expense power		Health power	
	Baseline specification	Survey year FEs	Baseline specification	Survey year FEs	Baseline specification	Survey year FEs
	(1)	(2)	(3)	(4)	(5)	(6)
Reform × *age_gap*	-0.00302**	-0.00445***				
	(0.00139)	(0.00141)				
Polygamy			0.457	-0.241	0.288	0.0822
			(0.539)	(0.354)	(0.483)	(0.325)
Observations	4436	4436	4436	4436	4436	4436
R-squared	0.083	0.088	0.079	0.047	0.012	0.048
F-statistics	25.52	23.92				

Notes: Panels A, B and C present the first-stage results and the causal impact of polygamy on female intrahousehold bargaining power for Hausa-Fulani, Igbo and Yoruba women respectively. The outcome variables are polygamy, expense power and health power presented in Columns (1)-(2), (3)-(4) and (5)-(6) respectively. Results for the baseline specifications are presented in Columns (1), (3) and (5). These control for age at marriage, religion (Islam and Christianity) and literacy. In addition to the individual-level control variables in the baseline specifications, I control for survey year fixed effects in Columns (2), (4) and (6). Robust standard errors are reported in parentheses. *, ** and *** indicate significance at 10 percent, 5 percent and 1 percent level.

7. Conclusion

This paper investigates the direct causal effect of polygamy on female intrahousehold bargaining power in Nigeria, using a natural experiment that exogenously exposed some cohorts of women to a new Islamic legal reform. Before this, I evaluate the impact of the reform on polygamy in a difference-in-difference framework. The results suggest the change in policy to have a statistically significant effect on polygamy: on the average, the reform decreased the probability of polygamy by 0.149 percentage points in the affected group. This is robust to alternative specifications, including survey year fixed effects and utilizing the non-weighted sample. In addition, analyzing whether these results could be explained by other phenomena rather than the reform, I find evidence in favor of the reform. After providing evidence in support of the relevance and exclusion restriction assumptions, I conduct an instrumental variables estimation of the direct causal effect of polygamy on female intrahousehold bargaining power. These results show that not being polygamous increases the probability of female intrahousehold bargaining power by 0.335 percentage points, on the average – with the result mainly driven by Hausa-Fulani women. Relative to the ordinary least squares (OLS) coefficients, results from the instrumental variables estimations are higher, suggesting that the OLS underestimates the

impact of polygamy on female intrahousehold bargaining power.

As the results suggest, being polygamous decreases the bargaining power of women and by extension, fuels gender inequality. This implies that to reduce gender inequality and empower women, policies aimed at dissuading them from entering into polygamous marriages could be pursued. But what should these policies be? One avenue proposed by the literature is increased female education attainment. Gould et al. (2008) posits that polygamy disappears as people become more educated. While this proposition could be true for other parts of the world, empirical evidence in sub-Sahara Africa does not support the presence of a negative impact of education on polygamy. For instance, Fenske (2015) finds that increased education attainment for women in Zimbabwe, Sierra Leone, Nigeria and Kenya does not reduce their probabilities of being polygamous. This is in line with Friedman et al. (2016), who observed that increased education attainment does not necessarily generate changes in attitudes among women.

A less obvious approach to reducing polygamy in sub-Sahara Africa is to provide incentives that reduce the demand for multiple wives among men. In the Middle East and North Africa, where polygamous women have legal rights over their husbands, prevalence of polygamy is about 12 percent (Tabutin et al., 2005). This is about half the prevalence rate in sub-Sahara Africa, where the practice, though culturally acceptable, is largely prohibited by civil laws. Also, results from this paper indicate that the reform, which also gave polygamous women legal rights over their husbands, reduced the probability of polygamy in the affected group. Taking these together, it is evident that prohibiting polygamy in cultural settings where it is accepted does not lead to its reduction. However, regularizing the practice places additional economic and legal costs on husbands, reducing their 'demand' for multiple wives (reduced polygamy rates) and hence, enhancing female intrahousehold bargaining power.

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Appendix

Summary statistics — polygamy vs monogamy

While the summary statistics presented for the DiD analyses focuses on the variables pre-reform, it is still relevant to examine these features of the data for the entire sample. Given the instrumental variables estimations, this is especially true for the paper. Table A1 reports the means and standard deviations of the variables for the full sample, polygamy and monogamy.

From Table A1, Column (1) presents means and standard deviations of the variables for the full sample of 57,7831 married women. In Columns (2) and (3), I split the sample into polygamous and monogamous women respectively – with polygamous women constituting about 27 percent of the entire sample. The results from difference-in-mean tests between the two groups are reported in Column (4) and show the differences to be statistically significant for all variables.

Senior vs junior co-wives

The basis for not considering polygamous senior co-wives in the definition of polygamy was the fact that the two groups of polygamous women (senior and junior co-wives) possessed different characteristics. Here, I evaluate the validity of this proposition with regard to female intrahousehold bargaining power. The results are in Table A2

From Table A2, there is a negative and statistically significant relationship between the instrument and the junior co-wives variable, for all specifications. Further, the F-statistics for all specifications are above 10. This is evidence in favor of the validity of the instrument. Also, polygamous senior-co-wives possess higher bargaining power relative to their junior counterparts. More specifically, results from the IV estimation in Panel B show being the senior co-wife to increase the probability of expense power by 0.189 percentage points, on the average, in the baseline specification. This is robust to controlling for fixed effects in Column (2). Also, being the senior the co-wife is associated with 0.20 percentage points increase in the probability of health power in the baseline. While an alternative specification of this relationship yields differences in terms of the magnitude of the effect, its direction remains robust. Based on this, it is evident that the two groups of polygamous women posses different characteristics, at least in terms of female intrahousehold bargaining power.

Table A1: Summary statistics — polygamy vs monogamy

	Full sample	Polygamy	Monogamy	Mean difference
	(1)	(2)	(3)	(4)
Expense power	0.39	0.25	0.45	-0.192***
	(0.49)	(0.44)	(0.50)	(0.005)
Health power	0.42	0.29	0.47	-0.177***
	(0.49)	(0.45)	(0.50)	(0.0050)
Reform	0.27	0.32	0.25	0.068***
	(0.44)	(0.47)	(0.43)	(0.004)
Age_gap	-10.17	-14.45	-8.58	-5.873***
	(7.68)	(9.30)	(6.27)	(0.068)
$Reform \times age\_gap$	-5.16	-7.02	-4.47	-2.549***
	(7.53)	(10.09)	(6.19)	(0.070)
Hausa	0.19	0.27	0.15	0.118***
	(0.39)	(0.44)	(0.36)	(0.004)
Fulani	0.06	0.08	0.05	0.027***
	(0.24)	(0.27)	(0.22)	(0.002)
Yoruba	0.08	0.05	0.09	-0.044***
	(0.27)	(0.22)	(0.29)	(0.002)
Igbo	0.09	0.03	0.11	-0.085***
	(0.29)	(0.17)	(0.32)	(0.003)
Islam	0.56	0.78	0.48	0.303***
	(0.50)	(0.41)	(0.50)	(0.004)
Christian	0.43	0.20	0.51	-0.305***
	(0.49)	(0.40)	(0.50)	(0.004)
Marriage age	18.99	17.51	19.54	-2.030***
	(4.90)	(4.23)	(5.01)	(0.045)
Illiterate	0.55	0.77	0.47	0.305***
	(0.50)	(0.42)	(0.50)	(0.004)
Observations	57831	15569	42182	

Notes: Columns (1)-(3) represent the means and standard for the various variables for the full sample, polygamous and monogamous women respectively while Column (4) is the mean-difference between polygamous and monogamous women. Standard errors are reported in parentheses. * indicates significance at 10 percent, ** indicates significance at 5 percent, *** indicates significance at 1 percent level.

Table A2: Differences between polygamous women — senior vs junior co-wives

A. OLS estimation				
Dependent variable	Expense power		Health power	
	Baseline specification	Survey year FEs	Baseline specification	Survey year FEs
	(3)	(4)	(5)	(6)
Junior co-wives	-0.0155**	-0.0157**	-0.0149**	-0.0153**
	(0.00714)	(0.00714)	(0.00745)	(0.00744)
Observations	14159	14159	14159	14159
R-squared	0.183	0.183	0.168	0.171

B. Instrumental variables estimation						
	First-stage		Wife rank and female bargaining			
Dependent variable	Polygamy		Expense power		Health power	
	Baseline specification	Survey year FEs	Baseline specification	Survey year FEs	Baseline specification	Survey year FEs
	(1)	(2)	(3)	(4)	(5)	(6)
$Reform \times age\_gap$	-0.0136***	-0.0143***				
	(0.000419)	(0.000439)				
Junior co-wives			-0.189***	-0.188***	-0.200***	-0.186***
			(0.0271)	(0.0266)	(0.0287)	(0.0280)
Observations	14118	14118	14118	14118	14118	14118
R-squared	0.164	0.166	0.148	0.149	0.132	0.140
F-statistic	199.1	177.7				

Notes: Panels A and B present the OLS and IV estimations respectively. The outcome variables are wife rank (junior co-wife), expense power and health power presented in Columns (1)-(2), (3)-(4) and (5)-(6) respectively. Results for the baseline specifications are presented in Columns (1), (3) and (5). These control for ethnicity (Hausa, Fulani, Yoruba and Igbo), age at marriage, religion (Islam and Christianity) and literacy. In addition to the individual-level control variables in the baseline specifications, I control for survey year fixed effects in Columns (2), (4) and (6). Robust standard errors are reported in parentheses. *, ** and *** indicate significance at 10 percent, 5 percent and 1 percent level.